FOOD SAFETY GUIDELINES FOR THE PREPARATION OF RAW EGG PRODUCTS

NSW GOVERNMENT
Department of Primary Industries
Food Authority

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Introduction

Salmonella is the most common type of bacteria associated with foodborne illness outbreaks in Australia.

Mishandling of eggs and egg-based products are a significant contributor to foodborne illness in Australia, and in NSW.

The pathogen *Salmonella* is known to be present on the surfaces of eggs and improper handling can lead to raw egg products becoming contaminated.

There are a number of factors that contribute to the strong association between foodborne illness outbreaks caused by *Salmonella* and food that is sold which contains raw egg. These include:

- Contamination of egg contents by *Salmonella* from the shell
- Failure to process (through acidification or heat) raw egg foods sufficiently to remove any *Salmonella* risk
- Failure to clean and sanitise equipment and food contact surfaces
- Temperature abuse (i.e. storage above 5°C), and
- Keeping beyond recommended storage life (maximum 24 hours) at refrigerated temperature

The practice of pooling eggs to produce a raw egg food significantly increases the likelihood of *Salmonella* contamination into a product which does not receive any further cooking or treatment to kill off harmful bacteria.

Many large outbreaks of *Salmonella* food poisoning have occurred in NSW and nationally as a result of raw egg foods, particularly where business hygiene and temperature control issues were apparent.

The raw egg products that are most commonly implicated in *Salmonella* food poisoning include:

- Sauces and spreads made with raw egg – e.g. mayonnaise, aioli, egg butter
- Desserts made without an effective cook step – e.g. tiramisu, mousse, fried ice cream
- Drinks containing raw egg – e.g. egg flip, raw egg high protein smoothies.

The easiest solution to reducing the risk of your retail food business being implicated in a foodborne illness outbreak caused by *Salmonella* is to avoid selling food containing raw egg.

The purpose of these guidelines is to give food retail businesses that sell food containing raw egg specific safety steps for its preparation and clear guidance and advice on how to meet food safety regulations. These businesses are strongly advised to follow this guidance document.

All food businesses need to meet the requirements of the Australia New Zealand Food Standards Code (Food Standards Code) to ensure they follow safe handling practices.

In order to protect customers from the risk of foodborne illness, businesses need to comply with Standard 3.2.2, Division 3, Clause 7 (see page 4) to ensure that only safe and suitable food is processed.

7 Food processing

1. A food business must –
   (a) take all practicable measures to process only safe and suitable food; and
   (b) when processing food –
      i. take all necessary steps to prevent the likelihood of food being contaminated; and
      ii. where a process step is needed to reduce to safe levels any pathogens that may be present in the food – use a process step that is reasonably known to achieve the microbiological safety of the food.
2. A food business must, when processing potentially hazardous food that is not undergoing a pathogen control step, ensure that the time the food remains at temperatures that permit the growth of infectious or toxigenic microorganisms in the food is minimised

This is particularly important for food businesses such as restaurants, cafés, bakeries and caterers that prepare and sell food containing raw egg.

Given there is a known risk in the preparation of raw egg products, the NSW Food Authority has developed these guidelines to assist businesses to undertake practices that will ensure that they comply with requirements when making products known to cause salmonellosis. The following guidance is recommended:

1. Use safer alternatives to raw eggs in foods which are not cooked. Alternatives include commercially produced dressings and sauces, or pasteurised egg products.
2. If using a raw egg product is the only option, then all of the following controls must be in place:
   a) Egg receival – reputable suppliers, good delivery and storage, no cracked, dirty or unstamped eggs
   b) Storage – correct storage and display of ingredients and product, including proper temperature control
   c) Processing – correct handling such as good personal hygiene (including good hand washing practices and proper use of gloves if used), use of sanitised egg separator, proper temperature control
   d) Premises – clean premises, fixtures, fittings and equipment, compliant hand wash facility, sanitised equipment (including egg separator) and food contact surfaces

   AND for foods containing raw egg, known to cause cases of salmonellosis steps e) and f) below

   e) The product is to be acidified to a pH of 4.2 (or less) or effectively heat treated.

   Foods containing raw eggs must be acidified to a pH of 4.2 (or less) through the addition of acidic ingredients such as lemon or vinegar

   OR

   Receive effective heat treatment such as sous vide to prevent contamination and growth of *Salmonella*.

   f) The treated raw egg product should be stored at or below 5˚C for no longer than 24 hours and should be discarded at the end of the day. A fresh batch should be made daily.

Note:

Under the Food Standards Code Division 3, Standard 3.2.2, temperature of products that allow disease causing bacteria to grow or produce toxins must be either at or below 5˚C during transport, storage and display. The Food Standards Code allows for alternative compliance provided the businesses can demonstrate the product's safety (Clause 25, Standard 3.2.2).

The '4-hour / 2-hour rule' is used by Food Standards Australia New Zealand (FSANZ) as an example of an alternative method for compliance (see page 12). If a business uses the '4-hour / 2-hour rule', then a documented system must be in place to demonstrate evidence that it is being used effectively.

Purpose and scope

This document aims to provide retail and food service businesses with information on the safe preparation of raw egg products. The document covers areas from receipt of eggs through to preparation of raw egg products. These areas can all potentially affect the safety of the product. It also includes an example of a monitoring system for use when acidifying raw egg products.

This document **applies to** the below foods that contain raw or lightly cooked egg known to cause cases of salmonellosis, including:

- sauces, dressings and creams
- deserts such as tiramisu, mousse and fried ice cream
- drinks such as shakes and smoothies

Recommendations 2(e) and 2(f) (page 4) as laid out in this guideline **do not apply** to certain products that contain raw or lightly cooked egg and have little or no history of causing salmonellosis due to their traditional method of preparation, use or storage including:

- cooked egg sauces e.g. hollandaise and béarnaise sauce
- cooked breakfast style eggs such as scrambled or poached eggs and omelettes
- cakes and soufflés (baked)
- meringues (oven baked)
- icing (high sugar content)
- marshmallows (boiled during preparation)
- frozen desserts such as ice cream or frozen mousse (frozen immediately after preparation)
- traditional dishes that incorporate a raw egg added when serving such as tartare, congee, and soups

This document does not cover all requirements of the Food Standards Code, in particular requirements relating to premises and equipment. Businesses are urged to read the Food Standards Code and ensure they meet the requirements of the Code as it relates to their business, including requirements for cleaning and sanitising.

Acknowledgements

This document has been developed with assistance from NSW local council environmental health officers.

Definitions

<table>
<tr><th>Term</th><th>Definition</th></tr>
<tr><td>Acidified product</td><td>Product with vinegar/lemon juice added to achieve a pH of 4.2 or less</td></tr>
<tr><td>Cleaning</td><td>The process of removing food and other types of soils from surfaces, equipment and utensils. Detergents are used to assist removal</td></tr>
<tr><td>Cracked egg</td><td>Eggs with a cracked shell (where a crack is visible by the naked eye or by candling). Hairline cracks often escape visual detection and can worsen as eggs move through the supply chain</td></tr>
<tr><td>Dirty egg</td><td>Egg with shell contaminated with visible faeces, soil or other matter (e.g. yolk, albumen, feathers)</td></tr>
<tr><td>Pathogenic bacteria</td><td>Bacteria capable of causing food poisoning e.g. Salmonella</td></tr>
<tr><td>Potentially hazardous foods</td><td>Food that has to be kept at a certain temperature to minimise the growth of any pathogenic bacteria that may be present in the food or to prevent the formation of toxins in the food
(Food Standards Code 3.2.2, Division 1, Clause 1)</td></tr>
<tr><td>Pasteurised egg product</td><td>Processing egg product to the time and temperature combination as follows :
<table>
<tr><th>Egg product</th><th>Retention temperature to be no less than (ºC)</th><th>Retention time to be no less than (minutes)</th><th>Maximum temperature to be immediately rapidly cooled to (ºC)</th></tr>
<tr><td>Egg pulp (without any sugar or salt)</td><td>64</td><td>2.5</td><td>≤ 7</td></tr>
<tr><td>Liquid egg yolk</td><td>60</td><td>3.5</td><td>≤ 7</td></tr>
<tr><td>Liquid egg white</td><td>55</td><td>9.5</td><td>≤ 7</td></tr>
</table>
(Food Standards Code 4.2.5, Division 3, Clause 21)
Retention time and temperature means the time required after the centre of the product achieves the specified pasteurisation temperature.</td></tr>
<tr><td>Foods sold containing raw egg</td><td>Food that is prepared with raw egg and consumed without further processing (e.g. without cooking). Examples include:
Sauces and spreads made with raw egg – e.g. mayonnaise, aioli, egg butter.
Desserts made without an effective cook step – e.g. tiramisu, mousse, fried ice cream.
Drinks containing raw egg – e.g. egg flip, raw egg high protein smoothies.</td></tr>
</table>

Term	Definition
Ready-to-eat foods	Food that is ordinarily consumed in the same state as that in which it is sold and does not include nuts in the shell and whole, raw fruits and vegetables that are intended for hulling, peeling or washing by the consumer. (Food Standards Code 3.2.2, Division 1, Clause 1) For retail businesses this would include cooked foods or other foods that have various dressings (e.g. raw egg mayonnaise acidified to pH less than or equal to 4.2)
Sanitise	To apply heat or chemicals, or heat and chemicals, or other processes, to a surface (e.g. food contact surfaces of equipment, eating and drinking utensils) so that the number of microorganisms on the surface is reduced to a level that: - does not compromise the safety of the food with which it may come into contact - does not permit the transmission of infectious disease (Food Standards Code 3.2.2, Division 5, Clause 20(2)(b)
Shelf-stable foods	Foods which can be stored unrefrigerated without affecting their safety or quality.
Sous-vide pasteurised eggs	Eggs that have been exposed to a mild heat treatment in a water bath to kill *Salmonella* that may be present, without actually cooking the eggs.
Temperature control	Means maintaining food at a temperature of: - 5°C or below if this is necessary to minimise the growth of infectious or toxigenic microorganisms in the food so that the microbiological safety of the food will not be adversely affected for the time the food is at that temperature; or - 60°C or above; or - another temperature – if the food business demonstrates that maintenance of the food at this temperature for the period of time for which it will be so maintained, will not adversely affect the microbiological safety of the food. (Food Standards Code 3.2.2, Division 1, Clause 1)

Receiving and storing eggs

Maintaining food safety begins by ensuring only safe and suitable ingredients are purchased from a supplier and that these items are stored correctly. The following information is provided to assist meeting the requirements of the Food Standards Code regarding the receipt and storage of food.

Supplier and food information

- A list of food suppliers should be maintained in case they need to be contacted.
- For all foods, the label or receipt needs to contain details of suppliers' names and addresses. Phone contact details should also be kept.
- Only accept eggs that are:
  - Clean, not cracked or leaking, and stamped.
  - supplied in clean packaging.
  - correctly labelled (i.e. with name of the food, the supplier's name and address date marking).
- Ensure proper stock rotation so that the oldest stock is used first (as long as they are within date).
- Items that do not meet these requirements should be returned to the supplier.

Storage of whole eggs

- Store whole eggs (egg in shell) in a refrigerator or cool room.
- Avoid temperature fluctuations and only take out what is required for service.
- Don't store fresh egg pulp that has been collected (pooled) in a bowl.

Other foods

Potentially hazardous foods and certain raw products will need to be stored under refrigeration at or below 5°C. This includes meat, chicken, seafood, dairy products and eggs.

- Only receive foods that are within their 'Use-by' date or 'Best Before' date.
- Only receive potentially hazardous food that has been transported under temperature control.
- Once received, all potentially hazardous foods must be placed under refrigerated storage at or below 5°C.
- Refrigerated raw ingredients must be stored separately from ready-to-eat foods and ingredients.
- Raw foods such as uncooked chicken and meat must not be placed above ready-to-eat foods in the refrigerator to prevent the raw juices from dripping onto them.
- Refrigerated unpackaged foods and ingredients must be covered during receipt and storage to protect against contamination.
- Store foods in accordance with the manufacturer's instructions.

Processing eggs – practical steps to control *Salmonella*

Preparing foods can involve a great deal of handling of both raw and cooked foods. Because raw egg products are eaten without any further cooking it is important that they are prepared correctly and safely.

Raw foods can contain bacteria and, if not handled correctly, the numbers of bacteria can grow. Poor handling of cooked foods can result in cross-contamination from raw foods and if not stored correctly, the number of bacteria can grow.

Below are some main points to assist in proper preparation of foods, particularly raw egg products, and to help avoid cross-contamination.

Equipment and utensils

- All equipment and utensils must be in good condition and able to be easily cleaned and sanitised.
- Food contact surfaces such as equipment, benches and utensils are to be clean and sanitised before use.
- Boards and utensils must be cleaned and sanitised between preparing different foods, especially when preparing foods that will not be further cooked (e.g. raw egg products).
- Use a sanitised egg separator to separate egg yolk from egg whites. Eggs must not be separated using their shells as the shells may contain traces of *Salmonella* on the surface.

Personal hygiene

All persons preparing and handling food must ensure they follow good personal hygiene practices:

- People who are sick with vomiting, diarrhoea or fever must not prepare or serve food.
- Take all practicable measures to prevent unnecessary contact with ready-to-eat food.
- Wash hands prior to preparing food and after handling non-food articles, using the toilet, smoking, drinking, eating and touching hair, scalp or body.
- Wash hands between handling of raw ingredients and ready-to-eat foods.

Use of disposable gloves

It is not mandatory for food handlers to use disposable gloves, although if used correctly they can assist with minimising contamination. When using disposable gloves they must be:

- Only used for one continuous task and then discarded.
- Regularly changed to avoid cross-contamination – this is especially the case when changing from preparing raw ingredients to handling ready-to-eat foods.
- Always discarded and not kept for later use once taken off.
- Removed and discarded before using the toilet, smoking, eating, drinking or touching the hair, scalp or body.

Handling of eggs

Because eggs can harbour *Salmonella* on the surface, the handling of eggs is critical. When handling eggs, follow these guidelines:

- Do not use dirty, cracked or unstamped eggs.

- Do not wash eggs. Washing makes them more susceptible to contamination. Discard dirty and cracked eggs.
- Visually inspect eggs before use to ensure there are no hairline cracks.
- Use raw egg pulp immediately – i.e. do not pool or store raw egg batches.
- Use a sanitised egg separator.
- Regularly prepare fresh batches of raw egg mixture:
  - For acidified egg product: document pH and storage times, store for maximum of 24 hours at or below 5˚C.
  - If any raw egg product is out of temperature control (i.e. not at or below 5˚C), then storage times and temperatures must be documented to demonstrate evidence of compliance with the '4-hour / 2-hour rule' (see page 12).

Preparation of acidified raw egg product

Correct preparation of acidified raw egg product (using vinegar or lemon juice) improves product safety:

- Product acidified to a pH of less than 4.2 inhibits the growth of pathogenic bacteria, including *Salmonella*.
- Acidification should occur as part of the preparation step and should be checked to ensure proper acidification has occurred. An example worksheet is provided in Appendix 1 (see page 16).
- It is important that the pH is measured and recorded as evidence to show that all practicable measures are being taken to process safe and suitable food.
- Once acidified, the product must be covered when not being used.
- It is important that the product is kept at or below 5°C and that the '4-hour / 2-hour' rule is observed.
- Acidified product must be discarded at the end of the day and a new batch prepared daily. Product must not be stored for longer than 24 hours.

Egg pasteurisation using a sous vide method

Eggs can be pasteurised in shell using a sous vide method. The pasteurised eggs can then be used in sauces or desserts, just like raw eggs. An example recipe for sous vide pasteurised shell egg is to hold the eggs in a water bath at temperature of 57°C for at least 75 minutes (Baldwin, 2010)[1]. Correct procedures should be followed to ensure the eggs are safe to use:

- Every batch of sous vide cooking should be documented. An example worksheet is provided in Appendix 2 (see page 17).
- Commercial equipment with adequate heating capacity and excellent temperature control should be used.
- Correct water temperature is essential for sous vide and it should be checked using a tip sensitive digital thermometer that is accurate to 0.1°C.
- Raw shell eggs must be fully immersed in the water bath.
- Eggs cooked using sous vide methods should be used immediately or cooled and refrigerated.

[1] Baldwin, D.E. (2010). Sous vide for the home cook. Incline Village NV USA: Paradox Press.

- If eggs are to be stored, they should be rapidly cooled in a 50:50 ice-water bath. Once cooled, they should be stored at or below 5°C in their shells for a maximum of ten days. They should be clearly labelled and stored separately from raw eggs.

Temperature control

- Temperature control throughout the operation is critical in minimising microbial growth, e.g. raw egg product must be at or below 5˚C. This includes all operations during receipt, processing, storage and display.
- If the raw egg product is out of temperature control (i.e. not at or below 5˚C), there must be documented evidence that the below '4-hour / 2-hour' rule is being met.

4-hour / 2-hour rule

Any ready-to-eat potentially hazardous food, if it has been at temperatures between 5˚C and 60˚C:

- For a total of less than 2 hours, must be refrigerated or used immediately,
- For a total of longer than 2 hours but less than 4 hours, must be used immediately, or
- For a total of 4 hours or longer, must be thrown out

(*ANZFA, 2001, Safe Food Australia – A Guide to the Food Safety Standards,* *www.foodstandards.gov.au/publications/pages/safefoodaustralia2nd519.aspx*)

Temperature measuring device

Businesses handling potentially hazardous foods must have a temperature measuring device. Thermometers must be easily accessible and able to accurately measure temperatures to +/- 1°C. Hence, thermometers should be calibrated to ensure accuracy. Appendix 3 (see page 18) provides information on calibrating thermometers.

Storage and display

Product must be stored and displayed to prevent cross-contamination. This includes:

- prepare and store in the same container that will be used for service (to prevent extra handling and potential for cross-contamination)
- use date labels to ensure only fresh batches are used
- do not top up or mix batches
- for acidified raw egg products:
  - make fresh batches daily
  - store at or less than 5°C
  - discard at end of day and store no longer than 24 hours.
- For sous vide pasteurised eggs:
  - store at or less than 5°C in their shells
  - discard within ten days of pasteurisation.

Premises

The cleanliness of the premises, fixtures and fittings assist in minimising cross contamination. In particular the following is important:

- An acceptable hand washing facility that includes:
  - warm running water
  - soap
  - single-use hand towels, for example paper towels.

Appendix 1: Acidification of raw egg products

At pH values of 4.2 or less, pathogenic bacteria do not grow, form spores or produce toxins. A product with a pH of 4.2 or less could be used as a control measure for preventing the growth of *Salmonella*.

Acidification of raw egg product using vinegar to a pH of 4.2 or less will stop the growth of *Salmonella* bacteria but other bacteria, yeasts or moulds can still spoil the product.

The pH of the raw egg product must be checked to make sure it has reached the 4.2 pH limit.

Note: it may be possible to use lemon juice instead of vinegar, depending on the recipe. However, the pH must still be recorded.

Steps for measuring pH

The pH of a raw egg product can be measured using a pH meter, pH strips or pH paper, as follows:

Once the raw egg product has been prepared, place a small sample (¼ cup) in a clean container.

Dip the pH paper/strip directly into the raw egg product and compare with the colour chart (for pH meters follow the manufacturer's instructions).

Record the pH on the *Raw egg product acidification check sheet* (see page 16).

If the pH is greater than 4.2, add more vinegar and mix, then take another pH reading.

Continue adding vinegar until pH is less than 4.2. If extra vinegar is needed, raw egg product recipes should be revised to account for the extra vinegar required.

Equipment needed for measuring pH values

Different pH measuring methods

pH paper

- The pH paper should be able to read pH in 0.3 units, although it is difficult to distinguish less than 0.6 of a unit.
- Incorrect readings can occur from improper handling (contamination from hands).
- pH paper requires careful handling.

pH strips

- The strips should read pH in units of 0.5 or less, although it is difficult to distinguish less than whole units.
- pH strips are easy to use and do not require as careful handling as the pH paper.

Hand held digital pH meter

- Meters read pH in 0.1 units with certainty.
- Some hand held pH meters also measure the sample's temperature and compensate the measurement for sample temperature.
- The meter requires calibration before use with at least a single buffer (buffer pH 4.0 is suitable for acidified raw egg product).
- The pH meter comes with instructions but may require some training of operators.

Raw egg product acidification check sheet

Preparation of acidified raw egg product						Date and time discarded and finished (must be within 24 hours of preparation)	Comments
Date acidified	Time acidified	Egg supplier	Amount made	pH (must be ≤4.2)	Signature		

Appendix 2. Sous vide egg pasteurisation check sheet

Sous vide egg pasteurisation						Date discarded (must be within 10 days of pasteurisation date)	Comments
Date of sous vide pasteurisation	Temperature of water bath	Length of sous vide pasteurisation	Egg supplier	Number of eggs	Signature		

Appendix 3: Temperature calibration and measurement

Calibration procedures

Hand held thermometers should be calibrated monthly and results recorded on a checklist.

Ice Point (0°C)

1. Fill a small container with crushed ice.
2. Add a little water to the container to make a nice slurry.
3. Place the thermometer in the centre of the container so that the point of the probe is in contact with the ice.
4. Allow the temperature reading of the thermometer to reach a steady reading.
5. Record the reading and calculate the difference from 0°C.
6. Thermometers with a deviation of more than 1°C should be discarded.

Boiling Water Point (100°C)

1. Fill a small container with boiling water.
2. Immediately place the thermometer in the centre of the container so that the point of the probe is in the centre.
3. Allow the temperature reading of the thermometer to reach a steady reading.
4. Record the reading and calculate the difference from 100°C.

Thermometers with a deviation of more than 1°C should be discarded.

Notes

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